

PROCEEDINGS
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HEMICYCLOPS PERINSIGNIS, A NEW CYCLOPOID
COPEPOD FROM A SPONGE IN
MADAGASCAR

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Eight species of the poecilostome genus *Hemicyclops* Boeck, 1873 (Clausidiidae) are known from Madagascar (Humes, Cressey, and Gooding, 1958; Humes, 1965). Four of these are associated with crustaceans (*Acanthosquilla*, *Axius*, and *Upogebia*), and four are known only from burrows of uncertain origin.

Only one species attributed to the genus, *Hemicyclops leggei* (Thompson and A. Scott, 1903) known only from a single male specimen from the Gulf of Manaar, Ceylon, has been reported from sponges. (The spelling of the specific name should be *leggei* and not *leggi* as used in the original description, since it is derived from the proper name Legge.)

The copepods were collected in 1967 during field work supported by a grant (GB-5838) from the National Science Foundation, and their study has been aided by another grant (GB-8381X) from the same foundation.

I am greatly indebted to Dr. Willard D. Hartman, Peabody Museum of Natural History, Yale University, for the generic name of the host sponge.

All figures have been drawn with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The abbreviations used are: P = paragnath, MXP = maxilliped, and P₁ - P₄ = legs 1-4. Measurements other than the dimensions of the entire

body were made on dissected specimens comprising two females and one male.

***Hemicyclops perinsignis*, new species**

Figures 1-27

Type-material: 10 ♀♀, 5 ♂♂, and 1 copepodid from an orange-red sponge, *Agelas* sp., in 23 m, Tany Kely, a small island south of Nosy Bé, northwestern Madagascar, 30 July 1967. Holotype ♀, allotype, and 10 paratypes (7 ♀♀, 3 ♂♂) deposited in the National Museum of Natural History (USNM), Washington; the remaining paratypes in the collection of the author.

Other specimens: 4 ♀♀, 4 ♂♂ from *Agelas* sp., in the type-locality, 30 June 1967.

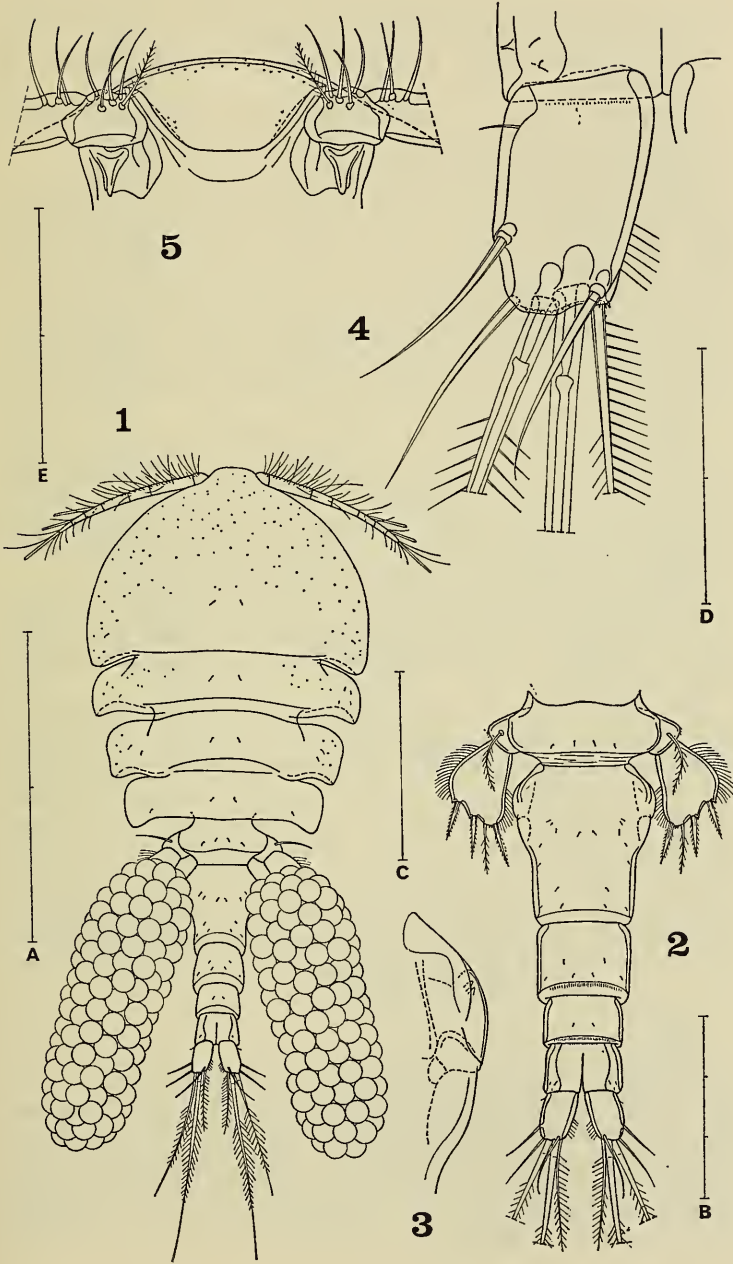
Female: The body (Fig. 1) has a broad flattened prosome. The length (not including the setae on the caudal rami) is 1.66 mm (1.44-1.92 mm) and the greatest width is 0.78 mm (0.70-0.86 mm), based on 10 specimens in lactic acid. The epimeral areas of the segments bearing legs 2-4 flare outwardly. The ratio of the length to the width of the prosome is 1.25:1. The ratio of the length of the prosome to that of the urosome is 1.38:1.

The segment of leg 5 (Fig. 2) is $121 \times 297 \mu$. Between this segment and the genital segment there is no ventral intersegmental sclerite. The genital segment is elongated, $253 \times 231 \mu$, in dorsal view moderately expanded in its anterior half. The genital areas are located laterally on the expanded portion. Each area (Fig. 3) bears two minute spini-form elements. The three postgenital segments from anterior to posterior are $126 \times 150 \mu$, $77 \times 132 \mu$, and $77 \times 124 \mu$. The membranes between these segments are finely striated. The posterior dorsal border of the second postgenital segment bears extremely small spinules. The posteroventral margin of the anal segment has a row of minute spinules on each side.

The caudal ramus (Fig. 4) is $100 \times 58 \mu$, the ratio of length to width being 1.72:1. The outer lateral seta is 73μ long, the dorsal seta 100μ , and the outermost terminal seta 88μ , all three naked. The innermost terminal seta is 180μ with prominent lateral spinules especially along the inner side. The two long median terminal setae are 385μ (outer) and 580μ (inner), both inserted between dorsal (smooth) and ventral (with minute spinules) flanges, and both with lateral spinules along

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FIGS. 1-5. *Hemicyclops perinsignis*, new species, female: 1, dorsal (A); 2, urosome, dorsal (B); 3, genital area, dorsal (C); 4, caudal ramus, dorsal (D); 5, rostrum, ventral (E). Scale A = 1.0 mm, B = 0.3 mm, C = 0.1 mm, D = 0.1 mm, E = 0.2 mm.



their midregions. The outer margin of the ramus bears a proximal setule and the inner margin has distally a row of hairs.

The body surface (Figs. 1 and 2) bears small hairs (sensilla) and refractile points.

The egg sac (Fig. 1) is elongated, $968 \times 300 \mu$, reaches well beyond the caudal rami, and contains many eggs $65\text{--}73 \mu$ in diameter.

The rostrum (Fig. 5) has a broad posteroventral margin.

The first antenna (Fig. 6) is 440μ long and slender. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 17, (55μ along the anterior margin), 112, 62, 78, 47, 46, and 42μ respectively. The formula for the armature is 5, 15, 7, 4, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete. All the setae are naked except the proximalmost seta on the first segment which is weakly plumose. The proximalmost seta on the third segment is directed proximally. In one female an extra small hyaline seta was seen on the first segment of the right first antenna (Fig. 7).

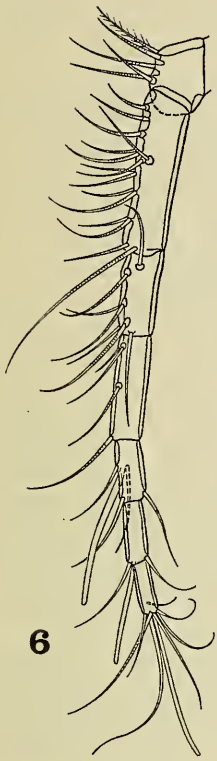
The second antenna (Fig. 8) is four segmented, with the armature 1, 1, $3 + 1$, and 7. On the third segment ($52 \times 37 \mu$ in greatest dimensions) the spine is clawlike distally and the outermost seta is often curved proximally (Fig. 9). The fourth segment is $52 \times 29 \mu$ in greatest dimensions (its length equal to that of the third segment) and bears three slender setae and four stout prehensile setae.

The labrum (Fig. 10) has six long setules, two median transverse rows of long spines, and two lateral groups of smaller spines. The postoral area has a complex ornamentation of small setules and spines (Fig. 10).

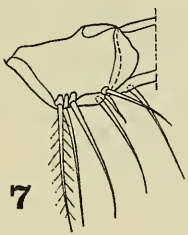
The mandible (Fig. 11) has terminally two stout elements and two setae (Fig. 12). The paragnath (Fig. 13) is a small lobe with an area of slender spinules apically and numerous hairs. The first maxilla (Fig. 14) has a small lobelike process on its anterior surface and bears terminally eight setae in two groups of 5 and 3 respectively. The second maxilla (Fig. 15) has three setae on the first segment, one of them short and slender. The second segment bears three setae and terminates in a slender prolongation having four unequal distal spiniform processes. The maxilliped (Fig. 16) has two setae on the first segment, two on the second segment, and one (naked) on the small third segment. The

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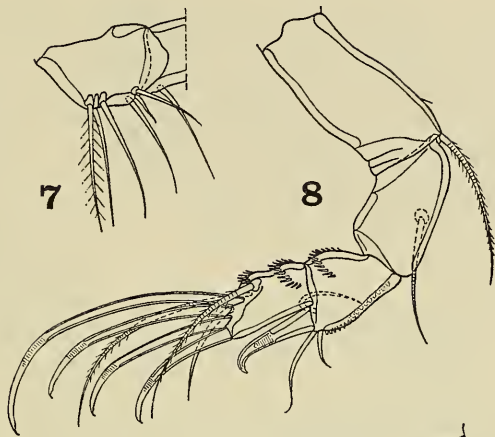
FIGS. 6-13. *Hemicyclops perinsignis*, new species, female: 6, first antenna, anterodorsal (E); 7, first segment of right first antenna, posteroventral (C); 8, second antenna, anterior (C); 9, third and fourth segments of second antenna, posterior (C); 10, labrum and postoral area, ventral (C); 11, mandible, anterior (D); 12, tip of mandible, posterior (F); 13, paragnath, ventral (D). Scale C = 0.1 mm, D = 0.1 mm, E = 0.2 mm, F = 0.05 mm.



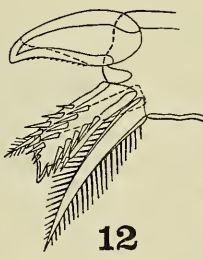
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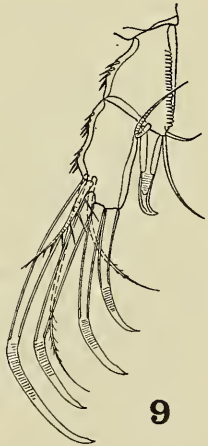
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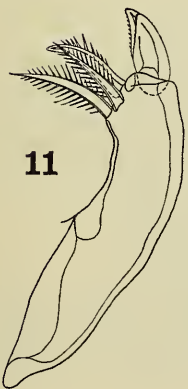
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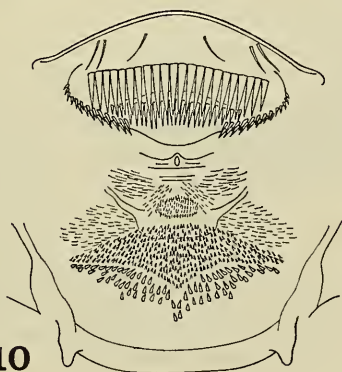
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fourth segment has four elements, two prominent barbed spinelike setae and two small naked setae. The second segment bears a distal row of slender spinules on its anterior surface.

The ventral area between the maxillipeds and the first pair of legs (Fig. 17) is not protuberant. A sclerotized bar extends between the bases of the maxillipeds.

The armature of legs 1-4 is as follows (the Roman numerals representing spines, the Arabic numerals setae):

P ₁	coxa	0-1	basis	1-I	exp	1-0;	I-1;	I, I, 6
					enp	0-1;	0-1;	I, 5
P ₂ + P ₃	coxa	0-1	basis	1-0	exp	1-0;	I-1;	II, I, 6
					enp	0-1;	0-2;	I, II, 3
P ₄	coxa	0-1	basis	1-0	exp	1-0;	I-1;	II, I, 6
					enp	0-1;	0-2;	I, II, 2

Leg 1 (Fig. 18) bears on its basis an inner spine 23 μ , this spine being absent in legs 2-4. The inner margin of the basis is smooth, but in legs 2-4 bears a few hairs. All outer spines on the exopod have subterminal flagella, while in legs 2-4 only the distalmost of these spines is so flagellated. The intercoxal plate has slender setules along its ventral margin, but in legs 2-4 this plate has spines (Fig. 17). Leg 2 (Fig. 19) and leg 3 are alike in all major respects. Leg 4 (Fig. 20) lacks the hairs on the outer coxal surface seen in legs 1-3 and has one less seta on the third endopod segment than in leg 3.

Leg 5 (Fig. 21) has a short broad free segment $130 \times 87 \mu$ in greatest dimensions or 1.5 times longer than wide. The three barbed spines are 73, 62, and 73 μ from outer to inner and the plumose seta is 81 μ . The seta on the body near the free segment is 86 μ . Both outer and inner margins of the free segment have a row of slender spinules.

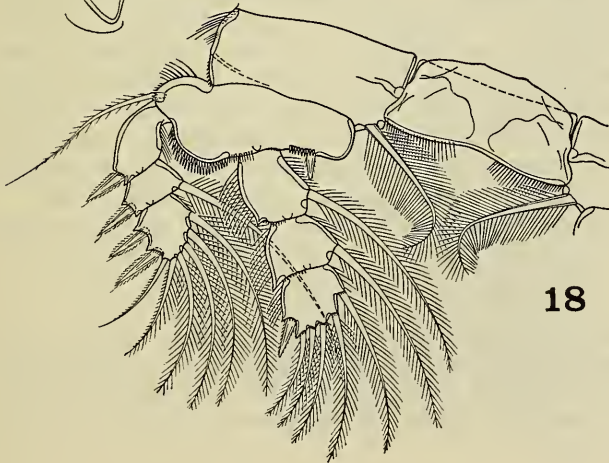
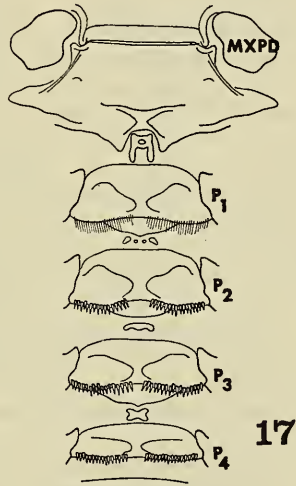
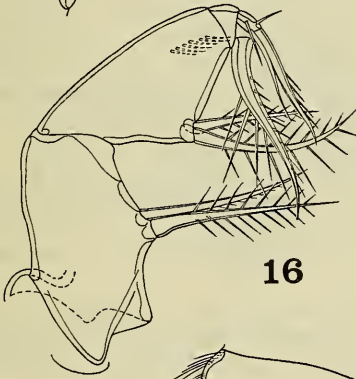
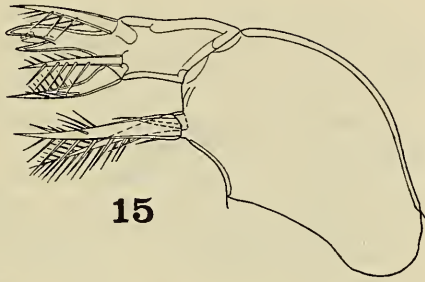
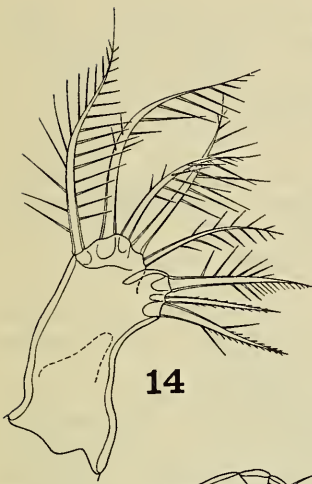
Leg 6 is probably represented by the two minute spiniform elements on the genital area.

Living specimens in transmitted light were very pale tan, the eye red, the eggs sacs brown.

Male: The body (Fig. 22) is a little less broadened than in the female. The length (without the ramal setae) is 1.26 mm (1.12-1.41 mm) and the greatest width is 0.58 mm (0.49-0.63 mm), based on 5 specimens in lactic acid. The ratio of the length to the width of the prosome is 1.29:1. The ratio of the length of the prosome to that of the urosome is 1.33:1.

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FIGS. 14-18. *Hemicyclops perinsignis*, new species, female: 14, first maxilla, posterior (D); 15, second maxilla, posterior (C); 16, maxilliped, posterior (C); 17, median area from level of maxillipeds to leg 4, ventral (G); 18, leg 1 and intercoxal plate, anterior (E). Scale C = 0.1 mm, D = 0.1 mm, E = 0.2 mm, G = 0.2 mm.



The segment of leg 5 (Fig. 23) is $100 \times 250 \mu$. There is no ventral intersegmental sclerite. The genital segment is wider than long, $138 \times 213 \mu$. The four postgenital segments from anterior to posterior are $107 \times 153 \mu$, $104 \times 135 \mu$, $62 \times 112 \mu$, and $60 \times 101 \mu$.

The caudal ramus resembles that of the female but is smaller, $73 \times 46 \mu$, with a ratio of 1.59:1.

The body surface bears hairs and refractile points as in the female. The refractile points are especially numerous on the ventral surface of the first, second, and fourth postgenital segments.

The rostrum, first antenna, and second antenna are like those in the female.

The labrum (Fig. 24) has fewer and much shorter median spines than in the opposite sex. The postoral area (Fig. 24) has a somewhat different ornamentation than in the female.

The mandible, paragnath, and first maxilla resemble those of the female. The second maxilla (Fig. 25) shows sexual dimorphism, the prolongation of the second segment here being stout, almost clawlike, and with an entire tip. The maxilliped (Fig. 26) has one seta on the first segment and two setae and three rows of spines on the second segment. The very small third segment is unarmed. The claw is 148μ along its axis and bears proximally a setiform process closely appressed to the concave surface of the claw and two very unequal setae.

Legs 1-4 are like those in the female.

Leg 5 resembles that of the female but is smaller, $104 \times 78 \mu$.

Leg 6 (Fig. 27) consists of a posteroventral flap on the genital segment bearing a single barbed seta 45μ .

The spermatophore was seen only within the body of the male (Fig. 23).

Living specimens were of a color similar to that of females.

Etymology: The specific name *perinsignis*, Latin = very remarkable, alludes to the unusual combination in this species of five setae on the first segment of the first antenna and five segments in the female urosome.

Comparison with other species in the genus: For the purpose of the differentiation of *Hemicyclops perinsignis* from other species in the genus, I have adopted the list of 23 sufficiently known species in the work of Vervoort and Ramirez (1966). Several forms which are insufficiently described or based on juvenile specimens are not considered here.

Hemicyclops perinsignis may be readily separated from those species

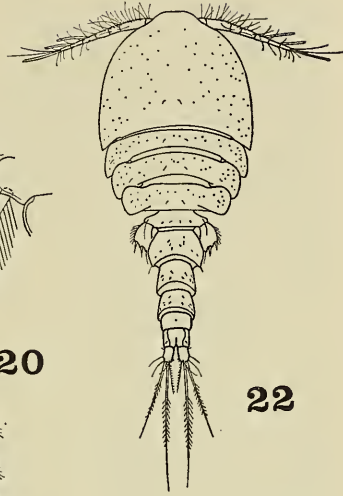
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FIGS. 19-21. *Hemicyclops perinsignis*, new species, female: 19, leg 2 and intercoxal plate, anterior (E); 20, leg 4 and intercoxal plate, anterior (E); 21, leg 5, dorsal (E). Scale E = 0.2 mm.

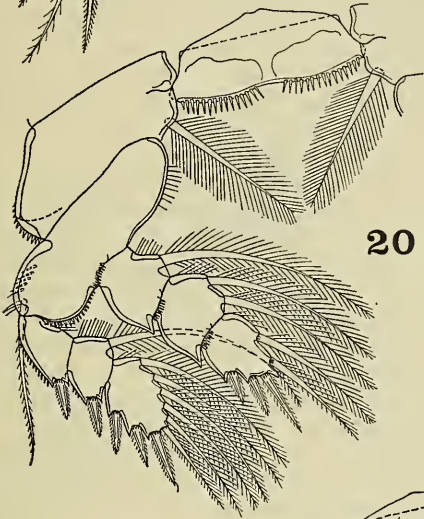
FIG. 22. *Hemicyclops perinsignis*, new species, male: 22, dorsal (A). Scale A = 1.0 mm.



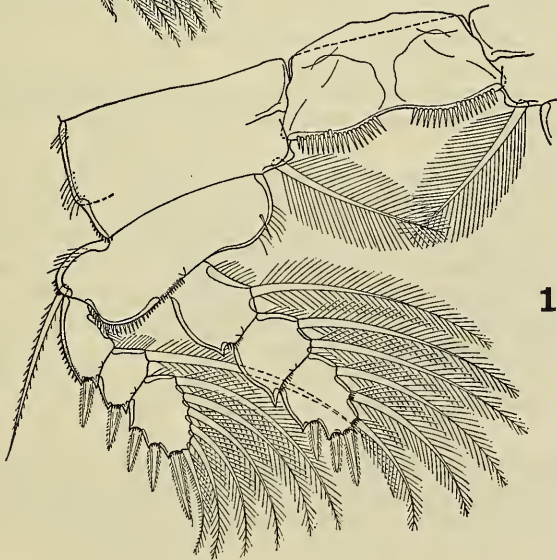
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of *Hemicyclops* which have only four setae on the first segment of the first antenna, and where the fourth segment of the second antenna is distinctly shorter than the third segment [*H. aberdonensis* (T. and A. Scott, 1892), *H. acanthosquillae* Humes, 1965, *H. amplicaudatus* Humes, 1965, *H. axiophilus* Humes, 1965, *H. bacescui* Șerban, 1956, *H. biflagellatus* Humes, 1965, *H. diremptus* Humes, 1965, *H. intermedius* Ummerkuty, 1962, *H. kombensis* Humes, 1965, *H. purpureus* Boeck, 1873, *H. thalassius* Vervoort and Ramirez, 1966, *H. thysanotus* C. B. Wilson, 1935, and *H. visendus* Humes, Cressey, and Gooding, 1958].

The new species may be further distinguished from those species in which there are six urosomal segments in the female, where the fourth segment of the second antenna is longer than the third segment, and where the tip of the mandible has only three elements [*H. adhaerens* (Williams, 1907), *H. arenicolae* Gooding, 1960, *H. carinifer* Humes, 1965, and *H. subadhaerens* Gooding, 1960].

The remaining species are mostly imperfectly described, but they may be distinguished from the new species in the following characters: *H. australis* Nicholls, 1944, and *H. leggei* (Thompson and A. Scott, 1903) have two setae on the first segment of the male maxilliped; *H. cylindraceus* (Pelseneer, 1929) has six urosomal segments in the female and only two elements on the tip of the mandible; *H. elongatus* C. B. Wilson, 1937, and *H. tamilensis* (Thompson and A. Scott, 1903), both poorly known, have six urosomal segments in the female; and *H. livingstoni* (T. Scott, 1894) has short robust segments in the first antenna and the third segment of the second antenna has two stout curved spines.

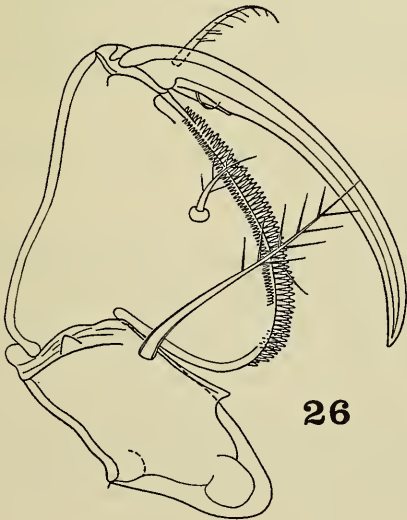
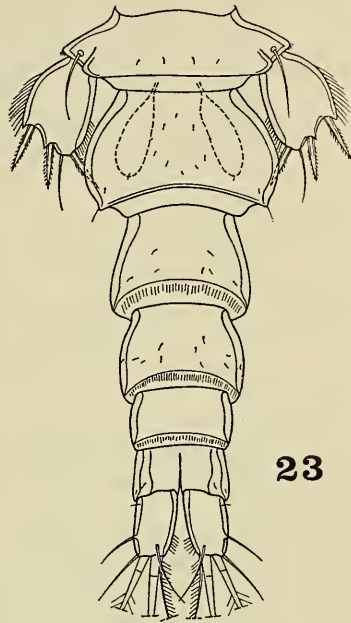
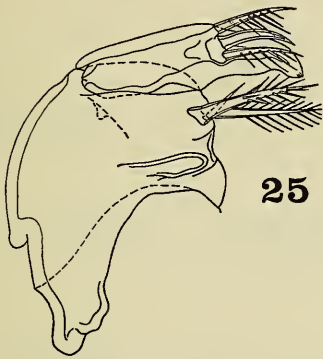
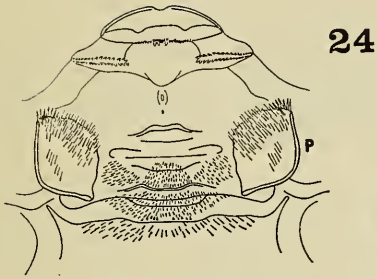
The single adult male *Hemicyclops* sp. described by Pillai (1963) is much longer (2.3 mm) than the new species, the caudal ramus is nearly 3:1, the fourth segment of the first antenna is the longest, and the free segment of leg 5 is more slender.

The two new species and the new combination mentioned by Gooding (1963, unpublished thesis) differ clearly in important ways from *H. perinsignis*.

Several distinctive characters of the new species which may be used in combination to differentiate it from other species within the genus are: the five-segmented female urosome, five setae on the first segment of the first antenna, the fourth segment of the second antenna about as long as the third segment, four terminal elements on the mandible, sexual dimorphism in the second maxilla of the male, and one seta on the first segment of the male maxilliped.

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FIGS. 23-27. *Hemicyclops perinsignis*, new species, male: 23, urosome, dorsal (G); 24, labrum, paragnaths, and postoral area, ventral (C); 25, second maxilla, anterior (C); 26, maxilliped, anterior (D); 27, leg 6, ventral (C). Scale C = 0.1 mm, D = 0.1 mm, G = 0.2 mm.



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